APPROVAL SHEET FOR SUSPENDED LOAD OPERATIONS

SLO-KSC-1991-020

TITLE To Operate/Utilize Clean Access Platform (CAP) at LC-39 Pad A and B

DOCUMENT NUMBER/TITLE OMI V5136 - Clean Access Platform Operation

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REQUIRED APPROVAL

CONTRACTOR ____ DESIGN ____ R & QA ____ OPERATIONS ____ SAFETY

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OPERATION: To Operate/Utilize Clean Access Platform (CAP) at LC-39 Pad A and B

SUPPORTING DOCUMENTS: The associated operational procedure/systems assurance analyses are as follows:

- OMI V5136, Clean Access Platform Operation.
- SAA09FTA3-001, System Assurance Analysis of the Clean Access Platform and Ten-Ton Hoists at the Pad RSS.

GENERAL DESCRIPTION: The task below will require personnel to be directly under the suspended Clean Access Platform (CAP) during orbiter payload bay operations. Specific operations requiring personnel to work under a suspended load will vary each mission and will be assessed by SFOC/NASA to ensure only mandatory operations are permitted.

The CAP is employed to provide access to the orbiter payload bay in order to allow for removal of the payload bay protective liner and cleaning of the bay when required. In addition, contingency access to the payloads for cleaning or verification closeout is provided.

The CAP platform is stowed beneath the Payload Ground Handling Mechanism (PGHM). The CAP is removed from its storage location and set on the Payload Changeout Room (PCR) floor, then rolled forward manually. The strongback ladders are assembled in this deployed position and the hoist blocks are then lowered and secured to the CAP. The CAP is lifted off the PCR floor; then the intermediate, end finger and side rotating platforms are extended via use of the common PGHM air motor tool.

The various cleaning, removal, and contingency access operations will require six people inside the PCR under the above described CAP operations to perform mission unique and contingency operations.

There will also be personnel below the PCR and the CAP to support vehicle pad operations.

RATIONALE/ANALYSIS: The suspended load tasks comply with the NASA Alternate Safety Standard for Suspended Load Operations as follows:

Alternate Standard Requirement #1a: The most probable mission unique operations have been thoroughly evaluated and cannot be conducted without personnel beneath the CAP.

Alternate Standard Requirement #1b: The possible use of a secondary support system, to catch the load in the event of a hoist failure, was analyzed. It was determined the use of a secondary support system was not technically, or operationally, feasible due to PCR space and load limitations below the CAP envelope.

Alternate Standard Requirement #1c: The number of personnel allowed under the suspended load inside the PCR at any one time is six.

The number of personnel beneath the PCR and the CAP will vary depending on scheduled pad operations. Because the CAP hoisting system is supported by two separate hoists, independently reeved, each designed to lift/lower the CAP, it is intended to allow personnel to walk or work beneath the PCR while the CAP is in use. Simultaneous failures of each hoisting system are required to allow the CAP to fall, penetrating the PCR floor.

Alternate Standard Requirement #1d: Length of time while working under the CAP will vary depending on mission, specific requirements, however, these operations will be planned and implemented to minimize the personnel and time required under the load. The length of time spent by personnel under the CAP inside the PCR is estimated to range from 10 minutes to 8 hours.

Alternate Standard Requirement #2: Suspended load operations are reviewed and approved on a case-by-case/specific need basis - see General Description and Alternate Standard Requirement #1.

Alternate Standard Requirement #3: Only those suspended load operations approved by the Center NASA Safety Assurance Director will be permitted. A list of approved suspended load operations will be maintained by the Center NASA Safety Assurance Directorate.

Alternate Standard Requirement #4: OMI V5136 does not describe any situations in which suspended load operations will occur. However, some payload processing operations will require one to six persons to perform work under the CAP. The place in the OMI where these suspended load operations will take place is unknown. Each payload is unique and produces its unique processing requirements. OMI V5136 will be revised with deviation sheets to

permit operations under suspended load only when mandatory. This procedure will be available on-site for inspection during the operation.

Alternate Standard Requirement #5: A new suspended load operation not covered by this SLOAA, deemed necessary due to unusual or unforeseen circumstances where real time action is required, shall be documented and approved by the Center NASA Safety Assurance Director.

Alternate Standard Requirement #6: The CAP hoists are designed, tested, inspected, maintained, and operated in accordance with the NASA Safety Standard for Lifting Devices and Equipment- NSS/GO-1740.9. The hoists utilize 3/4-inch wire rope and have a safety factor of 8.

The CAP hoisting system includes twin independent geared and lever actuated upper limit switches, Dillon low and high load limit switches, slack rope sensor switches, and two electronically operated holding brakes per hoist. Each of the four brakes can hold the load.

The Clean Access Platform weighs 10,000 pounds and has a safety factor of 2 against yield.

The CAP lifting slings are load tested annually at 100 percent of rated capacity. Detailed preventative maintenance is performed annually on the CAP/hoist lifting system. The hoist system is also inspected monthly, quarterly, and semi-annually to ensure proper operation per OMI Q6173.

Non-Destructive Testing of critical welds and the hoist hooks is performed annually.

Alternate Standard Requirement #7: A System Assurance Analysis (SAA) has been completed on the CAP and its 10-ton hoists. The SAA includes a Failure Modes and Effects Analysis/Critical Items List (FMEA/CIL) and a hazard analysis (see Supporting Documents). The SAA identifies no single failure points for the CAP or its 10-ton hoists.

Alternate Standard Requirement #8: Visual inspections for cracks or other signs of damage or anomalies are performed on the hoist blocks, wire ropes, brakes, etc., prior to each operation per NSS/GO-1740.9.

Alternate Standard Requirement #9: Trained hoist operators certified per NSS/GO-1740.9 shall remain at the hoist controls during CAP move operations.

Because the CAP is a man-rated system providing active redundancy via two separate independent support systems, operators shall not remain at the hoist controls when the CAP is static/hoists not powered.

Alternate Standard Requirement #10: Appropriate control areas inside the PCR are established and maintained prior to and during the operation. Only required personnel (man loaded in the procedure) are permitted in this area.

Alternate Standard Requirement #11: A pretask briefing and a safety walkdown of the area are conducted prior to the lift to ensure all systems and personnel are ready to support. All participants are instructed on their specific tasks and warned of the hazards involved. Following any crew change, new personnel are instructed by the Task Leader on their specific tasks and warned of the hazards involved.

Alternate Standard Requirement #12: The Task Leader will remain in voice contact with personnel beneath the suspended load inside the PCR. Upon loss of communication with the Task Leader, all operations will be stopped at that time by the Task Leader and/or Safety until communications are re-established.

Alternate Standard Requirement #13: Personnel working beneath the load shall remain in continuous sight of the Task Leader.

Alternate Standard Requirement #14: The Center NASA Safety Assurance Directorate shall conduct periodic reviews to ensure the continued safety of suspended load procedures.

Alternate Standard Requirement #15: The Center NASA Safety Assurance Directorate will provide copies of approved SLOAAs, a list of approved suspended load operations, a list of cranes/hoists used for suspended load operations and copies of the associated FMEA/CIL and hazards analyses to NASA Headquarters.

APPROVAL: DATE: 2/26/99

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